What is claimed is:

1. In a frequency division duplex (FDD) mobile communication system, an apparatus for forward beamforming in a base station using an array antenna, comprising:

an arrival angle range estimation means for estimating an angle of arrival (AOA) range of a user signal from a reverse link received data and generating an estimated AOA range;

an array receiver and demodulation means for spatial-filtering a data received through the array antenna and demodulating a data fed back from a terminal;

a forward beamforming weight control means for calculating a plurality of transmission beamforming weights steering the estimated AOA range and selecting one beamforming weight steering a direction with a best forward channel condition for data channel transmission using the feedback data; and

a forward beamforming and modulation means for transmitting the data channel signal using the selected beamforming weight and transmitting a user pilot signal by sequentially using the plurality of the transmission beamforming weights at different time areas.

2. The apparatus as recited in claim 1, wherein the arrival angle range estimation means divides a base station sector into a plurality of angle areas, calculates the signal powers for the respective angle areas, and designates the

angle area for which the signal power is greater than a threshold value as the AOA range.

3. The apparatus as recited in claim 2, wherein the arrival angle range estimation means calculates the user signal power for each angle area by averaging a power of an inner product of the beamforming weight steering the corresponding angle area and an array response vector of the user signal expressed by an equation as:

$$\lambda_{m,n} = E\{|\mathbf{w}_{r,m}^{H}\,\mathbf{r}_{\mathrm{xd,n}}|^{2}\}$$

where, $\lambda_{m,n}$ represents the power of a n-th multipath component of the user signal received through the m-th angle area,

$\mathbf{w}_{r,m}$ is a column vector representing a beamforming weight steering the m-th angle area, and

$\mathbf{r}_{xd,n}$ represents an array response vector of the n-th multipath component of the user signal, and is estimated by an equation expressed as:

$$\mathbf{r}_{xd,n} = E\{\mathbf{x}d_{n}\}$$

where, $\mathbf{x}$ is a received snapshot vector, and

d_n is a reference signal correlated with the n-th multipath component of the user signal.

4. The apparatus as recited in claim 1, wherein the

forward beamforming and modulation means includes:

a control signal generation unit for generating a user-specific pilot bit;

a code generation unit for generating a data channel code and a control channel code;

a data channel spreading unit for multiplying a transmit data by a data channel code to generate a data channel signal;

a control channel spreading unit for multiplying a control signal bit received from the control signal generation unit by a control channel code to generate the control channel signal;

a data channel beamforming unit for multiplying the beamforming weight selected for data channel transmission by the data channel signal to generate a data channel signal vector;

a control channel beamforming unit for sequentially multiplying the plurality of beamforming weights steering the estimated angle range by the control channel signal at different time areas, to thereby generate a control channel signal vector; and

a vector addition unit for adding the data channel signal vector and the control channel signal vector.

5. In a frequency division duplex (FDD) communication system, a feedback apparatus of a terminal for supporting a base station system using an array antenna to perform a forward beamforming, comprising:

a plurality of finger means for generating a data channel correlation value and a control channel correlation value; and

a direction selection means for calculating a user pilot signal power for each time area and feeding a time area number corresponding to the greatest power back to the base station.

6. In a frequency division duplex (FDD) mobile communication system, a method for forward beamforming in a base station using an array antenna, comprising the steps of:

a) estimating an angle of arrival (AOA) range of a user signal from reverse link received data, thereby generating an estimated AOA range;

b) calculating a plurality of beamforming weights steering the estimated AOA range;

c) transmitting a user pilot signal by sequentially using the plurality of beamforming weights at different time areas through a control channel to estimate a forward channel condition.

d) identifying a time area number fed back from a terminal; and

e) transmitting a data channel signal using a beamforming weight corresponding to the time area number fed back from the terminal.

7. The method as recited in claim 6, wherein, in the step a), the user signal AOA range is estimated by dividing a base station sector into a plurality of angle areas, calculating

the signal powers for the respective angle areas, and designating the angle area for which the signal power is greater than a threshold value as the AOA range.

8. The method as recited in claim 6, wherein, in the step b), the control channel includes a user pilot signal and a time area number, wherein the time area number corresponds to the beamforming weight to be used for the data channel transmission at a next block.

9. In a frequency division duplex (FDD) mobile communication system, a feedback method in a terminal capable of supporting a base station system, which uses an array antenna, to perform a forward beamforming, the feedback method comprising the steps of:

a) calculating a user pilot signal power for all fingers at the respective time areas; and

b) feeding a time area number corresponding to the greatest value among the calculated powers back to the base station.

10. The feedback method as recited in claim 9, wherein, in the step a), the user pilot signal power for all fingers at the respective time areas is calculated using an equation as:

$$\beta_j = \sum_i \left|\alpha_{i,j}\right|^2$$

where, β_j represents the user pilot signal power at j-th time area, and

$\alpha_{i,j}$ represents a complex channel value for i-th multipath signal at j-th time area.

11. In a frequency division duplex (FDD) mobile communication system, a computer-readable recording media storing software program instructions for executing a method for forward beamforming in a base station using an array antenna, the method comprising the steps of:

a) estimating an angle of arrival (AOA) range of a user signal from reverse link received data, thereby generating an estimated AOA range;

b) calculating a plurality of beamforming weights steering the estimated AOA range;

c) transmitting a user pilot signal by sequentially using the plurality of beamforming weights at different time areas through a control channel to estimate a forward channel condition;

d) identifying a time area number fed back from a terminal; and

e) transmitting a data channel signal using a beamforming weight corresponding to the time area number fed back from the terminal.

12. In a frequency division duplex (FDD), a computer-

readable media storing software program instructions for executing a feedback method in a terminal capable of supporting a base station system to perform a forward beamforming, comprising the steps of:

a) calculating a user pilot signal power for all fingers at the respective time areas; and

b) feeding a time area number corresponding to the greatest value among the calculated powers back to the base station.